

Gray (J. P.)

---

# PATHOLOGICAL RESEARCHES.

By JOHN P. GRAY, M. D., LL. D.,

Medical Superintendent New York State Lunatic Asylum. Professor of  
Psychological Medicine at Bellevue Hospital Medical College.

[From the *American Journal of Insanity*, for January, 1876.]

---





Dr. F. A. CASTLE,

# PATHOLOGICAL RESEARCHES.

By JOHN P. GRAY M. D., LL. D.,

Medical Superintendent New York State Lunatic Asylum. Professor of  
Psychological Medicine at Bellevue Hospital Medical College.

The elemental constitution of the various organs of the body, the processes of development and growth, and the constant changes which occur in ordinary waste and repair, and the laws of their evolution and of their general and special functions, in health, belong to histology and physiology. All changed and disordered physiological and anatomical conditions belong to pathology. It is impossible to define the pathology of insanity in distinct terms, as it is still a subject of investigation. The boundary of our knowledge is not only limited, in this field, but, as any one will find who will take occasion to read the subject up, the nature of the morbid changes are still not satisfactorily solved. Indeed those changes are just what we are investigating, in the hope of substituting positive knowledge, by examination of the actual lesions, for the various speculative theories.

In a paper on pathology, read before the Association two years ago, I endeavored to present the general,

\*Read before the Association of Medical Superintendents of American Institutions for the Insane, held at Auburn, N. Y., May, 1875.



morbid processes observed in insanity. I wish now to bring before you the nature of the changes which occur, and the anatomical character of the products of the pathological changes, embracing all stages and conditions of the disease, from acute mania to the most chronic forms of insanity; also general paresis and syphilization of the brain. The components of structure, are, you are all aware: 1. Blood vessels. 2. Lymph spaces and canals. 3. New cells. 4. New fibres. 5. Neuroglia, or connective tissue.

The pathological laws to which the brain is subject, are the same that obtain in all other parts of the organism; that is, the processes are the same everywhere, but the products are modified by the cell structure of the different parts involved; and the cell being, indeed, the ultimate element, as far as we know, upon which life depends, its alterations are of the highest possible moment.

Infiltration and involution are the terms used to express certain changed conditions in the tissues. These two terms characterize the morbid phenomena and morbid processes of which I will speak. Infiltration is in one sense a passive process. That is, its products are normal, but in excess, and the deposits are out of place. The deposits are fatty infiltration, calcification, pigmentation and amyloid bodies. These, as you will understand, are more or less normal products. It is proper to assume that there must be some loss of vital property, which renders the tissue or organ powerless to resist the invasion of this process. These deposits, we know, occur in the gradual failure of age. Infiltration is therefore more in the nature of a chemical process. Involution is, on the other hand, a physiological process, but a deviation from the normal mode, and the type of structure is changed. In involution, therefore, the

degeneration is in the nature of metamorphosis of the tissue, and is not a deposit. The change always commences in involution, in the nucleus of the cell, the germinal point itself, and a cell of a different character, of an entirely different type is developed. The exception to this is colloid involution which does not commence in the nucleus. In infiltration the deposit is never in the nucleus, but always commences in scattered points in the protoplasm of the cell. In involution the cell is inevitably lost by its transformation into another and different structure. In infiltration the cell is only embarrassed and distorted by deposition of foreign matter, which may be re-absorbed; the nucleus or germinal point of the cell not being affected. In infiltration, the new deposit has no inherent life—it is powerless to increase itself—it is only increased by aggregation. In involution, the new formation is itself a living cell, and capable of reproduction, or what is called proliferation. This proliferation or increase, is often very rapid. Now, when we speak of fatty degeneration, for instance, of the ganglion cells of the brain or cord, or of the cells of the muscular fibres of the blood vessels, there is great difference between the form of fatty infiltration and fatty involution.

Now we shall examine these more particularly. In considering the conditions of degeneration and decomposition of the tissues of the human body, we must always keep in mind certain organic laws, which are concerned in the normal development and formation. Each organ is built up of cells of different characters, forms and functions. These cells, from their genetic unity, their mutual dependence and reciprocal action, constitute what we call organic life. They act upon and with each other, as parts of a totality, and though so different, are really members of one family, in their

mode of origin, their life, and their processes of decay. As soon as this harmony of action is disturbed or lost, that is, as soon as this peculiar mutual dependence and reciprocation are interfered with or cease, health is disturbed or death occurs. These results—sickness and death—we then suppose to be the consequence of those altered relations and anatomical changes.

I shall first endeavor to bring before your minds the anatomical changes in the structure of the tissues. Bear in mind that life consists of continual change of constituents, in its development, growth and maintenance, and also in its decay; that the life of the body, as a whole, depends on that of the several organs, and that the physiological activity of these rests upon the life of the cells of which they consist. No change of constituents occurs without being followed by change of forms; and no change of forms occurs without some alterations being manifested in the life. So, it will be observed, that the normal changes manifest themselves in the functions of the organs. So, also, changes are manifested in altered functions under anatomical changes in the constituted tissues which enter into their composition. The tissue changes produced by age, and which would seem to be the natural, or, so to speak, normal mode of decay, are therefore, not only interesting, but of the highest importance to the student of histology. Indeed, it will be observed that those produced by disease are quite similar in character. As those of age gradually bring about the normal death of the whole organism, so we find conditions similar, which, so to speak, are premature senescence, and which lead to the gradual death of organs and tissues by successive involvement of parts and progressive changes. The gradual progress of insanity, after certain morbid processes are set up, would go to sustain the view.

In considering anatomical changes of tissues, we must distinguish between those conditions in which death of the tissue, has preceded the changes, and those in which the changes have occurred prior to the death of the tissue. The former are known as necrosis, mortification and gangrene, and are marked by a more or less complete dissolution of the organic structure. Here then is destruction of form and composition, and, in certain cases, dessication or drying up, under the action of simple chemical and physical forces.

Notwithstanding all this, the parts affected, mainly owing to an entire interruption of nutrition, may at the same time be unusually rich in blood. Here, however, the condition of the afferent arteries may be the obstacle to the supply of blood, and we have anæmia in consequence of the interruption of the circulation in the capillary system. These tissues being thus cut off from the nutritive fluid, and practically separated from the life of the whole organism, a chemical action is set up and decomposition of the tissues takes place, which is sustained by the large amount of water, about eighty per cent., which the normal organism contains. Now, this process is marked by the dissolution of the organized albuminates, and the formation of the most varied chemical compounds, which differ according to the seat of the destruction, and the products which are deposited, as crystallized or amorphous matter, liquids or gaseous bodies, which diffuse themselves into the surrounding tissues. This is the process of complete mortification. The presence of foreign living organisms are a cause of partial and local mortification. Not only the so-called vibriones, the bacteria, the botrytis, the aspergillus, &c., which are found in gangrenous conditions of the various organs, and even in the blood itself are causes, but also the processes of

life of the trichina and the great variety of the entozoa. Mechanical action, as concussion, crushing, &c., may properly be mentioned as a cause, and not an uncommon one, of necrosis or local death of tissue. Now, in all these instances, as before stated, the death of the tissue, that is partial or entire interruption or intermission of the function in the part, precedes the anatomical changes.

In the following conditions, the changes precede the functional impairment or death. There are cases where there is gradual but final extinction of function, by a gradual but entire transformation of the tissues affected, into other tissues, as in cancer; and other cases when the changes are only transient, or when they are limited, in which we have modification of function, as in inflammation; and again, there are cases when the changes are progressive, but so slight as not to impair the function notably, though continuing through life, such, for instance, as rheumatic deposits. Still, even in such cases as the latter, function is impaired, and the parts will not endure strain.

As we have already stated, the modes of impairment and death of tissues are designated under the terms, infiltration and involution, which I have already sufficiently explained. I have said that the character of the conditions of infiltration is rather that of a passive change. The parts affected preserve in the main, the external form even in advanced stages, and the physiological action rarely ceases entirely. However, in proportion to the degree of changes, the form, in all cases, must be altered and the function disturbed. The processes in infiltration may be defined in quite an exact manner, as they are so largely chemical.

While the nutritive constituents, dissolved in the fluids, which pass continually through the organs and

cells, in the ordinary progress of life, show no traceable influence of their action and presence, as the constituents are taken up and utilized; certain other materials, normal or abnormal constituents, which are retained in the cells and described as a precipitate upon a filter, would be seen at once. They leave the trace; they can not be appropriated. However, this precipitate is to be considered, whether or not as produced by the action of the cells themselves, it is a combination of certain albuminates, contained in the protoplasm of the cells affected, with certain materials of the nutritive fluids. In fact, there is probably an adulteration of the nutritive fluids, a dyscrasia, which manifests itself by producing the same chemical and anatomical changes in various and different parts of the organism, as we see in fatty and other deposits. In some instances, however, the deposits are purely local. However, all organs, tissues and cells, are not equally susceptible to the production and retention of peccant material.

There are now recognized four different kinds or conditions of infiltration: that is, the amyloid, calcification, pigmentation, and the fatty infiltration.

I. The amyloid infiltration is a condition first pointed out by Virchow, and so named from the re-action of its products, which is similar to that which takes place in vegetable starch when treated with iodine, and from the microscopic appearance of its deposits. These amyloid deposits stand, however, in a very limited relation to that well known product of vegetable life. According to chemical analysis the amyloid substance belongs to the large class of the *albuminates*. An albuminate, however, with this prominent characteristic, that it is always near the point of becoming solid, more so even than the fibrinous substance of the blood. On analyzing the amyloid infiltrated tissues, the cells

are found enlarged from one-third to twice their normal size, and homogeneous, colorless and translucent. The nucleus is rarely recognized in the advanced stages. Concentric stratified bodies will be found in place of cells. Sometimes, as in the lining membrane of the ventricles of the brain, these amyloid bodies appear in an enormous amount, scattered through the tissues; they are also abundant in grey atrophy of the brain.

II. The second condition of infiltration is that of calcification, which is the impregnation of the tissues with phosphate or carbonate of lime, in a solid form, and also in combination with albuminates. The lime salts are soluble in liquids which contain carbonic acid, and belong to the normal constituents of the nutritive fluids, and are indispensable substances for the preservation of a large class of the tissues, as the bones, &c. An abnormal disposition of these salts must be generally considered as due to local causes. How far the obstruction of the lymph capillaries, and the lymph spaces, which seem to serve as drains for any excessive amount of nutritive fluids and constituents, may be connected with these abnormal deposits, is still a question with physiologists. However, it is well known that the bodily textures in which calcareous impregnations occur normally, as the osseous tissue, the membranes of joints, &c., are entirely without lymphatic vessels. Morbid, or pathological calcification, therefore, occurs more as a secondary production in consequence of inflammation and pathological nerve formations, as in gout; however, the principal seats of this deposit are the vessels and connective tissue, the cellular and glandular tissues, the muscles and the cartilages. It is most common as the result of age; indeed it would seem to be a normal result of senescence. In the earlier stages, the deposits of lime are comparatively harm-

less, or at least they are easily borne by the tissues, if not excessive. The forms of the tissues are retained in their outlines, and it is only in the more advanced stages that the physiological functions of the parts are seriously interrupted, or cease entirely. When large masses or secretions of calcareous character occur, we generally find some pathological nerve formation as the foundation. They have often as a nucleus some mechanical substance; deposits in kidneys, bladder, lungs, &c.

III. Pigmentation is a process of infiltration of a pathological character quite similar in many respects to calcification of tissues. From our present knowledge of the chemical nature of the coloring matters infiltrated into the tissues, or found there, there can be no doubt that they are derived from a pre-existing albuminous compound, the hæmatin, or coloring matter, of the red corpuscles of the blood. The hæmatin is combined with a colorless albuminate, globuline or crystalline.\* In pathological processes, then, as in the gradual changes of advanced life, when deposits occur, we may presume that other cells, also, as well as those of the liver, &c., may have or acquire, the property of introducing or separating the coloring matter from the serum of the blood, and of condensing it as a deposit in their structure. The material is always present in the blood. In the majority of cases it is probably due to local disturbances in the circulation, especially to abnormal and persistent accumulations of blood, as in hyperæmia and stasis, and particularly by extravasations, in small areas, or capillary hæmorrhages, in which there is repetition of the hæmorrhage for several days. The blood corpuscles, thus cut off from the general current, become

---

\*The hæmatin, as is shown by Valentine and Staideler, is the radical base of the bile coloring matters, the coloring matter of urine also, giving all the scale of colors from red and yellow to brown and black, which we find in the various pigmentary impregnations.

discolored, and this altered hæmatin or hæmato-globuline is secreted in a soluble form, and taken up by the cells of the surrounding tissues. Hence the frequent occurrence of pigmentation of the ganglion cells of the nervous system, due, as remarked, to frequently repeated hyperæmic states, as the pigmentation in the medulla, in epilepsy, where there are good reasons to suppose the existence of capillary hæmorrhage, from the symptoms. These phenomena are still more strikingly associated in the progress of general paresis, in which we see marked pigmentation. The cells are more frequently pigmented through the intercellular substance, and the fibres, and the homogeneous membranes. In pigmentation, however, the nucleus remains, so that we are probably justified in concluding that the cell function does not entirely cease in this form of infiltration. How far the disturbance of function may occur, we can not know, except by further investigation.

IV. The fourth, and perhaps the most important condition of infiltration is the fatty. The condition of fatty infiltration of the tissues, as heretofore stated, is clearly distinguished from fatty involution. The occurrence of fatty globules and deposits in the cells, is simply the presence of a sufficient amount of this normal constituent. But the fat thus retained in the protoplasm of the cell clearly indicates a pathological condition. The fat is first deposited in small shining globules, as seen under the microscope, which, in further advanced stages, flow together and constitute large drops of fat. These accumulations often so increase as to press the nucleus and protoplasm of the cell aside, so that a single large globule will sometimes fill its entire cavity; however, when the nucleus remains, the fat may be absorbed and the nucleus resume its functions. The question would arise from what source

have we this quantity of fat? In fatty dyscrasia the blood shows signs of change, the serum is opalescent, tinted and emulsion-like. Fats are removed from one part of the system and deposited in other parts, a fatty metastasis. Local fatty infiltrations are generally accompanied by an atrophy of the parts involved, and a general or local diminution of the chemical activity. This is so in a marked degree in fatty infiltration in muscles. The physiological consequences of fatty infiltrations are very different according to the organs and tissues affected, While a liver whose cells have undergone those changes, has not entirely lost its power of yielding bile, or while a fatty infiltrated vessel still resists the pressure of the blood current, and thus has some action; the fatty muscle or nerve fibre seem at once to show defect, and finally the physiological power is extinct.

In involution the pathological processes are widely different from those of infiltration, which we have just discussed. These were pointed out generally in the early part of this paper. In involution the changes are not passive and retrogressive, as in infiltration, but active and progressive. In involution we have changes not only in the protoplasmic contents of the cell, but in the cell itself; an actual transformation into a cell structure of a different character and form. While the metamorphosis progresses, the functional life of the cell gradually ceases.

As heretofore stated, the change in involution commences in the nucleus, or even in the nucleolus of the cell, and thus it would seem that this elemental or germinal point was concerned in the morbid action in the very beginning, in this process of degeneration. There are four recognized forms of involution: 1. Fatty metamorphosis. 2. Cloudy swelling. 3. Mucoid soft-

ening. 4. Colloid degeneration. In regard to the chemistry of these degenerations there is very little known. In fatty involution we have first the separation of fat in minute globules from the albuminous protoplasm of the cell, with which in the normal state it is intimately combined. In cloudy swelling there is coagulation of the albuminates of the cells, and the protoplasm is transformed into a minutely granular substance, while at the same time the nucleus commences to swell by imbibition into an irregular body. In mucoid softening, contrary to this the albuminates become soluble. In colloid degeneration, there is coagulation which forms a body of a gelatinous consistence. These are the general characteristics in these several changes in involution.

I. The anatomical appearance of a cell undergoing fatty involution may be thus described. The nucleus of the cell loses its smooth, shining and transparent appearance, and the nucleolus is observed by an accumulation of finely divided, granular, fatty matter heretofore spoken of. Soon afterwards it swells up, and then, instead of seeing one nucleolus in the nucleus, you will see two or three small spherical nucleoli formed. The nucleus now fills out until it occupies the whole space of the cell, and divides into two, three or more granulated masses, which rapidly enlarge, and finally rupture the membrane of the cell. Then you see distinctly the several granule cells. These, in a limited degree, may again multiply by division, a process, however, which soon ceases, leaving the already formed granular masses for further changes. The fat of the granule cell crystallizes, or the granular corpuscle itself disintegrates, and a fatty ditritus is formed, without cell life or organization. These now become the nidus for local softening. You will recall here the fact that the

fat in infiltration remains in the cell, while here, in involution, it is at length outside, and this is fatty degeneration.

II. The condition of a cell in cloudy swelling, in consequence of the coagulation of the albuminates as before stated, resembles very much the phenomena observed in cells in the condition of *rigor mortis*, where the protoplasm, also coagulated, becomes immoveable. But there is this striking difference. In cloudy swelling the nuclei show an augmented activity, as in fatty metamorphosis. They are found enlarged, and the whole cell is puffed out. (These granules are not yet fatty, but are soluble in acetic acid, and need not, therefore, be mistaken for the first stage of fatty involution,) and the nucleus soon divides. Afterwards, it passes into fatty metamorphosis, thus producing the destruction of the cell. In some cases, however, the process recedes, and the cells return to their normal constitution.

III. Mucoid softening, the third condition of involution, is a process in which the tissues undergo a gradual liquefaction in consequence of the albuminates passing, under a pathological process, from a solid to a soluble condition. These albuminates, under this modification, are collectively called mucus, a substance which has an extraordinary capacity of swelling by imbibition, and thus forming a substance presenting all grades of consistency from that of tough jelly to a thin synovia. This modification is also marked by another quality, an entire incapacity for diffusion. This peculiarity is of the greatest importance. When a tissue has undergone these changes, the product will remain where formed, until it is either mechanically removed or is converted into another substance capable of being absorbed. When the mucus remains, it will be at all

times likely to enter into the composition of new pathological structures and textures, among which the so-called mucous tissue is the most prominent. The softening of the cartilage is illustrative of mucous tissue. You will bear in mind that this mucus cannot be absorbed by capillaries, or be in any way taken into circulation, as its consistency forbids this.

IV. Intermediate, between mucoid softening and cloudy swelling, according to its anatomical appearance, is the fourth condition of involution, colloid degeneration. The colloid substance is a colorless, transparent globule, of a fat-like refraction, and a trembling gelatinous consistence. Colloid bodies are developed within the cells. The protoplasm takes on uniformly a homogeneous and strongly refractive state, and the nucleus is pressed to one side, against the enveloping membrane of the cell, as the globules grow, and at length the colloid mass or globule, loosening itself from the place of its formation, takes the place of the cell. Thus freed, it continues to enlarge, and pushes aside the surrounding tissues, and there is formed there a kind of smooth walled cyst, or there may be a system of anastomosing or intercommunicating cysts, as in the so-called alveolar cavities.

We proceed now from these general considerations of pathological formations, to those which have been found in the brain and nerve system. The nervous centers are the most complicated structures, the seat of the most obscure phenomena, and so protected from physical exploration that their study is necessarily surrounded with difficulties. From examination of cases of unmistakable insanity, we find that with the exception of colloid degeneration, the conditions of involution are more frequently found in acute insanity, while in the chronic and progressive stages of the disease, conditions of infiltration prevail.

(We leave out of consideration pathological nerve formations, such as tumors, cancers, &c.)

Commencing in the vascular system, inducing states of hyperæmia and consequent anæmia, we have the greater part of the first causes of the histological changes observed. The conditions of dyscrasia and their consequences are here to be included. The hyperæmic state and local stagnation of the blood must produce a saturation, so to speak, of the tissues with fluid. We have the formation of aneurismal dilatations of the vessels as one condition impairing their walls, and producing pressure; as a consequence of this, we may and do have dissecting aneurisms, or pouring out from the vessel, through its ruptured wall, a quantity of blood into the adventitia. The adventitia may also give way and we may then have this blood free, or a hæmorrhage may at once occur, of considerable amount. Now, in those conditions it is plain we have the preparative states for inflammatory action and softening, and at least local destruction of the part.

Again, if a small area of brain matter becomes hyperæmic, the blood stasis in the arteries and capillaries may not only diminish the supply of nutritive fluid to the parts and the cells with which they are anatomically related, but this stasis may continue and become so complete as to entirely deprive the tissues of fluid. In the first condition we have at once an anæmic state, from defective supply, and this condition may continue, and when there are numerous areas thus affected, may induce a quite general anæmic state. The consequences of this will be diminished production of nerve force, embarrassed cerebral action, and general physiological disturbance. Out of such conditions we have the commencement of insanity. If the second condition occurs, that of complete stasis or embolic packing, and

the circulation is entirely arrested in the area affected, then the processes of involution are set up, and the vessel, with its contents, is transformed into fat granules, as we have found on examining recent cases, where death took place not only in the first stages of the disease, but accidentally, or at least not as a consequence of progressive insanity, or any acute inflammatory process in the brain. So also the cells themselves and the neuroglia and the nerve fibres unnourished, must undergo some one of the processes of degeneration.

These changes embrace the entire range of pathological anatomy and in chronic cases, all these may be found. These products bear a relation, in some degree, to the progress of the disease. Their order would seem to be: 1. The vascular system. 2. The connective tissue, or neuroglia. 3. Ganglion cells and new fibres. The etiology of these changes, that is the cause and history, as far as we have knowledge is as follows: first, hyperæmia then anæmia. In considering the changes which take place in the vascular tissues, we must look at the structure and distribution of the vessels in the various parts. Each part of the nervous center has its peculiar vascular arrangement, and the consequences of irregular circulation are modified thereby. The parenchyma of the reticulated structures of the membranes of the brain, requires but little nutrition itself, but the other membranes, the arachnoid, the pia mater, are a net-work of vessels, large and small, with abundant space for dilatation in their delicate and loose structure. This structure, therefore, presents favorable conditions for setting up inflammatory processes, for their extension, and for exudation, and we have these conditions as the result of pathological disturbances in the circulation, as meningitis, &c. The dura mater is compact in structure, and there is but little space

in its parenchyma for inflammatory processes and hyperæmic conditions; exudations are mainly found on its inner surface.

The brain substance itself is compact, and its vessels are almost entirely of the smaller caliber, and serve only for the purpose of its nutrition. The vessels, too, are far more numerous in the grey cortical portions than in the white or fibrous structure. The vessels of the brain tissue also have little connection as a system of vascular distribution. Each area of nutritive vessels represents small territorial areas of tissue. States of hyperæmia are therefore more likely to occur in limited sections of the brain, owing to this character of vascular supply. The vessels imbedded in the dense nervous tissues, are also, except in a very limited degree, little capable of distension and contraction. The enveloping sheath or adventitia, with its contents, (the so-called perivascular sheath and perivascular spaces,) are the only channels for allowing distension from superabundance of fluids; hence the favorable conditions for impacting the vessels and impeding or arresting the circulating fluid. This structure is also unfavorable in its anatomical arrangement for receding processes, or removing of the pathologically increased quantity of blood or other products, as deposits or exudations.

This structure of the nervous centers, as must be apparent, in their relation to the heart and circulation, must favor exudative processes, dilatation of vessels, aneurismal conditions, as the miliary aneurisms of Charcot, dissecting aneurisms of Virchow, which are prominent among the conditions which initiate local cerebral hæmorrhages. They also, by pressure on the surrounding tissues, produce disturbance of functions, and pathological changes in the otherwise unaffected tissues, and thus diffuse or extend the mischief; hence

the facility with which, in limited sections of the brain and cord, a hyperæmic state, or conditions of fullness of vessels may be developed by increased or diminished heart action under feeble conditions of nerve energy. In ordinary cases of nervous prostration, especially connected with hysteria, we frequently see those hyperæmic localizations in the eyes, face and neck, and sometimes even well marked ecchymosis from rupture of capillaries. These hyperæmic conditions continuing, we have stasis of blood in the capillary vessels and a thrombic condition of the vessels by the gradual impaction with blood corpuscles. This state more seriously interferes with the supply of the blood, and anæmia is set up in the parts of the tissue which those vessels supply. Finally, this continuing, the vessels having still further filled, an actual state of embolic packing takes place, and the supply is completely cut off in the vessels affected. Thus the anæmic state is increased. These conditions, as our investigations have shown, occur not in isolated vessels in those locally hyperæmic areas, but in a large proportion of the vessels. In the embolized vessels there is no longer function, and they are in a condition for states of fatty involution, or the other processes of degeneration mentioned. So also are the neuroglia, the nerve cells, and nerve fibres implicated, as we have distinctly seen through the microscope, in cases examined.

This summary of anatomical changes, and the pathological physiology associated therewith, brings us to the description of certain products or changes of the brain structure in insanity, which we shall endeavor to illustrate. It is proper to remark that in dealing with such delicate tissues and such minute objects, already largely magnified on the photographic plate, and some of them, when thrown on the screen, more than twenty thousand

diameters, you must not expect to see the whole field well defined. An object, as a capillary vessel, or a process of a ganglion cell, or a nerve fibre may be shown by a magnifying power, under which it would be difficult, if not impossible, to show at the same time the more minute structure. This obliges us to show a larger number of slides.

The following were presented from photo-micrographs on glass, by aid of the magic lantern, to illustrate the address :

## I. Vessels.

1. A curved capillary, with its lymphatic sheath, distended and infiltrated with fatty and pigmentary masses, from the upper central convolution of the brain—in paresis.

2. Dissecting aneurism in a small artery of the brain. Rupture of the internal coat, and effusion of blood into the adventitia.

3. Thrombus in a small artery of the brain, organized and attached to the lower wall of the vessel, filling two-thirds of its lumen.

4. Embolism of a capillary from the corpus striatum—in acute mania.

5. Embolism of three branches of a capillary from the corpus striatum—in acute mania.

6. Fatty involution of the nuclei of the spindle shaped cells of a capillary. The cells outlined by treatment with a solution of nitrate of silver—acute mania.

7. Fatty involution of the nuclei of the spindle shaped cells of a capillary, further advanced stage, division of the nuclei—acute mania.

8. Fatty involution of the nuclei of the spindle shaped cells of a capillary, third stage, disintegration of the vessel—acute mania.

9. Fatty involution of the nuclei of the muscular coat of an artery of the brain, development of granule cells.

10. Fatty involution of the nuclei of the adventitia of a vein, and developed granule cells.

11. Chain of granule cells with the residua of a disintegrated capillary.

12. Cluster of granule cells with residua of disintegrated capillaries.

13. Complete fatty involution of an artery and infiltration of the same, with granule cells.

## II. Nerve cells, nerve fibres and neuroglia cells.

1. Healthy ganglion cells from the anterior horn of the spinal cord.

2. Healthy ganglion cells from the posterior horn of the spinal cord.

3. Healthy pyramidal cell from the third layer of the upper central convolution, with a connective tissue cell attached to it.

4. Two pyramidal cells of the third layer, in the first stage of fatty involution.

5. Complete fatty involution of a large group of pyramidal cells from the second and third layer; the cells are transformed into chains of pearl-like granules, so arranged that they still resemble the shape of the cell; the processes are disintegrated.

6. One of the cells more enlarged.

7. Healthy pyramidal cell from the third layer of the third left frontal convolution.

8. Pyramidal cells from the same region with two nuclei of the neuroglia, in complete fatty involution.

9. Pyramidal cells from the third layer of the upper central convolution in a state of cloudy swelling.

10. Healthy connective tissue cells, the so-called Deiter's cells.

11. Group of Deiter's cells in a state of cloudy swelling.

12. Transverse section, through the lateral columns of the medulla oblongata, showing the fibres and their axis-cylinder, in health.

13. Transverse section through the same region in fatty involution—paresis.

14. Longitudinal section through the same region in fatty involution of the nerve fibres—paresis.

15. Colloid bodies in large ganglion cells of the medulla oblongata.

16. Section through the root of the nervus trigeminus, with colloid bodies.

17. Section through the medulla oblongata near the raphé, with colloid bodies.

18. Fatty infiltration of a large motor cell of the spinal cord.

19. Pigment infiltration of two ganglion cells of the posterior cornu of the spinal cord.

20. Amyloid bodies from the ependyma of the lateral ventricles.

21. Calcification of pyramidal cells of the third layer of the upper parietal convolution—in melancholia.

22. Concentric arrangement of oblong nuclei of the neuroglia, in first stage of calcification.

23. Concentric arrangement of oblong nuclei of the neuroglia, in second stage of calcareous infiltration in the center of the concentric layers.

24. Concentric arrangement of oblong nuclei of the neuroglia, in state of complete calcification

25. Concentric arrangement of oblong nuclei of the neuroglia, a very large mass breaking up.

26. Transverse section through the anterior quarter of the medulla oblongata at the level of the fully developed olivary bodies; showing a part of the raphé, the left olivary body, the nucleus of the lateral columns, the left anterior pyramid.

27. The same in a case of paresis, showing sclerosis of the anterior pyramid.

28. The sclerosed patches more enlarged.



# THE AMERICAN JOURNAL OF INSANITY.

---

THE AMERICAN JOURNAL OF INSANITY is published quarterly, at the State Lunatic Asylum, Utica, N. Y. The first number of each volume is issued in July.

EDITOR,

JOHN P. GRAY, M. D., LL. D., *Medical Superintendent.*

ASSOCIATE EDITORS,

JUDSON B. ANDREWS, M. D.,	} <i>Assistant Physicians.</i>
WILLIS E. FORD, M. D.,	
ALFRED T. LIVINGSTON, M. D.,	
T. F. KENRICK, M. D.,	

THEODORE DEECKE, *Special Pathologist.*

---

## TERMS OF SUBSCRIPTION,

Five Dollars per Annum, in Advance.

---

EXCHANGES, BOOKS FOR REVIEW, and BUSINESS COMMUNICATIONS may be sent to the EDITOR, directed as follows: "JOURNAL OF INSANITY, STATE LUNATIC ASYLUM, UTICA, N. Y."

The JOURNAL is now in its thirty-third year. It was established by the late Dr. Brigham, the first Superintendent of the New York State Lunatic Asylum, and after his death edited by Dr. T. Romeyn Beck, author of "Beck's Medical Jurisprudence;" and since 1854, by Dr. John P. Gray, and the Medical Staff of the Asylum. It is the oldest journal devoted especially to Insanity, its Treatment, Jurisprudence, &c., and is particularly valuable to the medical and legal professions, and to all interested in the subject of Insanity and Psychological Science.

